

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

Claims 1-19 (cancelled).

~~20.~~ (previously presented) A computer-implemented method for use in creating a digital model of an individual component of a patient's dentition, the method comprising:

- (a) scanning the patient's dentition, or a physical model thereof, to produce a data set that forms a three-dimensional (3D) representation of the patient's dentition;
- (b) applying a computer-implemented test to the data set to identify data elements that represent portions of an individual component of the patient's dentition; and
- (c) creating a digital model of the individual component based upon the identified data elements, wherein applying the computer-implemented test includes identifying elements of the data set that represent a structural core of the individual component to be modeled and labeling those data elements as belonging to the individual component, wherein the individual component to be modeled includes an individual tooth and the structural core approximately coincides with neurological roots of the tooth.

~~21.~~ (previously presented) The method of claim ~~20~~, wherein applying the computer-implemented test includes applying a test to link other data elements to those representing the structural core and labeling the linked data elements as belonging to the individual component.

~~32.~~ (original) The method of claim ~~21~~, wherein applying the test to link other data elements to those representing the structural core includes assigning a distance measure to each element of the data set, where the distance measure indicates a measured distance between a

reference point in the dentition and the portion of the dentition represented by the data element to which the distance measure is assigned.

4 23. (original) The method of claim 22, wherein applying the test to link other data elements includes linking a data element to the structural core if the assigned distance measure is less than the distance measure assigned to a data element representing a portion of the structural core.

5 24. (original) The method of claim 22, wherein the reference point lies on a tooth surface.

6 25. (original) The method of claim 21, wherein applying the test to link other data elements to the structural core includes applying a test to determine whether a data element lies outside of the dentition and, if so, labeling the data element as a background element.

7 26. (original) The method of claim 25, wherein applying the test to determine whether the data element lies outside of the dentition includes comparing an image value associated with the data element to a threshold value.

Claims 27-99 (cancelled).

8 100. (previously presented) A computer-implemented method for use in creating a digital model of a tooth in a patient's dentition, the method comprising:

(a) scanning the patient's dentition, or a physical model thereof, to produce a 3D dataset representing at least a portion of the patient's dentition, including at least a portion of a tooth and gum tissue surrounding the tooth;

(b) applying a test to identify data elements lying on a gingival boundary that occurs where the tooth and the gum tissue meet;

(c) applying a test to the data elements lying on the boundary to identify other data elements representing portions of the tooth, wherein applying the test to identify data elements on the gingival boundary includes creating an initial 2D plane that intersects the

dentition roughly perpendicular to an occlusal plane of the dentition and that includes data elements representing an initial cross-sectional surface of the dentition and wherein applying the test includes locating a cusp in the initial cross-sectional surface.

~~9~~ 101. (original) The method of claim ~~100~~⁸, wherein locating the cusp includes calculating rate of curvature of the initial cross-sectional area at selected points on the cross-sectional surface.

~~10~~ 102. (original) The method of claim ~~101~~⁹, wherein locating the cusp includes identifying the point at which the rate of curvature is greatest.

~~11~~ 103. (original) The method of claim ~~100~~⁸, wherein applying the test includes creating a second 2D plane that is roughly parallel to the initial 2D plane and that includes data elements representing a second cross-sectional surface of the dentition.

~~12~~ 104. (original) The method of claim ~~103~~¹¹, wherein applying the test includes locating a cusp in the second cross-sectional surface.

~~13~~ 105. (original) The method of claim ~~104~~¹², wherein locating the cusp in the second cross-sectional surface includes defining a neighborhood of data elements around the cusp in the initial cross-sectional surface and projecting the neighborhood onto the second cross-sectional surface.

~~14~~ 106. (original) The method of claim ~~105~~¹³, wherein locating the cusp in the second cross-sectional surface includes searching for the cusp only within the neighborhood projected onto the second cross-sectional surface.

~~15~~ 107. (previously presented) The method of claim ~~100~~⁸, wherein applying the test includes locating two cusps in the initial cross-sectional surface.

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108. (original) The method of claim 107, wherein applying the test includes creating a second 2D plane that is roughly parallel to the initial 2D plane and that includes data elements representing a second cross-sectional surface of the dentition.

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109. (original) The method of claim 108, wherein applying the test includes locating two cusps in the second cross-sectional surface.

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110. (original) The method of claim 109, wherein locating the cusps in the second cross-sectional surface includes defining two neighborhoods of data elements around the two cusps in the initial cross-sectional surface and projecting the neighborhoods onto the second cross-sectional surface.

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111. (original) The method of claim 110, wherein each neighborhood projected onto the second cross-sectional surface includes data elements representing portions of the tooth and data elements representing the gum tissue surrounding the tooth.

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112. (original) The method of claim 111, wherein the data elements representing the tooth include voxels of one color and the data elements representing the gum tissue include voxels of another color.

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113. (original) The method of claim 111, wherein locating the cusps in the second cross-sectional surface includes locating the pair of data elements representing gum tissue that lie closest together, where each of the two neighborhoods projected onto the second cross-sectional surface includes one of the data elements in the pair.

Claims 114-115 (cancelled).

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116. (previously presented) A computer-implemented method for use in creating a digital model of a tooth in a patient's dentition, the method comprising:

(a) scanning the patient's dentition, or a physical model thereof, to produce a 3D dataset representing at least a portion of the patient's dentition, including at least a portion of a tooth and gum tissue surrounding the tooth;

(b) applying a test to identify data elements lying on a gingival boundary that occurs where the tooth and the gum tissue meet; and

(c) applying a test to the data elements lying on the boundary to identify other data elements representing portions of the tooth, wherein applying the test to identify data elements on the gingival boundary includes creating a series of roughly parallel 2D planes, each intersecting the dentition roughly perpendicular to an occlusal plane of the dentition, and each including data elements that represent a cross-sectional surface of the dentition, wherein the cross-sectional surface in each 2D plane includes two cusps that roughly identify the locations of the gingival boundary, and, wherein applying the test includes identifying the cusps in each cross-sectional surface.

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~~117~~ (original) The method of claim ~~116~~, wherein identifying the cusps includes locating the cusps in one of the planes and then confining the search for cusps in an adjacent plane to a predetermined area in the vicinity of the identified cusps.

Claims 118-192 (cancelled).